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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/797,264	03/10/2004	Matthias H. Regelsberger	H10210/JDP	5357

1333 7590 11/24/2008

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EXAMINER	
PHAM, HAI CHI	
ART UNIT	**PAPER NUMBER**
2861	
MAIL DATE	**DELIVERY MODE**
11/24/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/797,264	REGELSBERGER ET AL.	
	Examiner	Art Unit	
	Hai C. Pham	2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,6,26-29,32-36 and 39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,6,26-29,32-36 and 39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03/10/04* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 6, 26-27, 29, 33-34 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada (JP 8-39860) in view of Ng et al. (US 5,818,501) and Uebbing et al. (US 4,982,203).

With regard to claims 1 and 6, Sawada discloses an image forming apparatus and a method for uniformizing exposure energy between respective LEDs while equalizing average exposure energy between respective LED chips (10-1 through 10-3), the method comprising repeatedly calculating a light-output correction for each of a plurality of subsets of the LEDs (the method steps S11-S16 are performed repeatedly on the LEDs 12, which are organized into a plurality of groups or chips 10-1 to 10-3) [0021], each sub-set being controlled by a respective one of a plurality of different controllers (each of the plurality LED chips 10-1 to 10-3 is driven by a corresponding drive circuit 14-1 to 14-3) (Fig. 3) [0041]-[0042], each light-output correction for one of the LED subsets being calculated based at least upon factors pertaining to (a) a light output from the LED subset associated with the light-output correction being calculated for that subset (the emission quantity is measured for each LED in a chip and the

emission quantity correction adjusts the light intensity of each LED in that chip based on the measured emission quantity), and (b) an average light output from the plurality of subsets of the LEDs (the average exposure energy EA of a chip is calculated based on the exposure energy of the respective LEDs of that single chip and is compared to the predetermined desired value E0, which is the "final average exposure energy of all the chips built into a print head") [0019] [0024], wherein each light-output correction for one of the LED subsets facilitates correction of the light output from its associated LED subset as a function of applied voltage or supplied current (the adjustment of the emission of the LEDs in the chip is made by altering the time duration applied to the supplied current from the corresponding drive circuit, and the adjustment is performed separately for every chip) [0024], adjusting the light output from the LED subsets as a function of applied voltage or supplied current in accordance with the corresponding light-output corrections (the emission quantity of the LED in each chip is adjusted based on the correction values obtained separately for each chip) [0024], wherein each of the plurality of subsets of the LEDs includes more than one LED (each LED chip 10 comprises 64 LEDs 10-1 to 12-64) (Fig. 3) (see also Abstract).

Sawada fails to teach each calculation of a light-output correction occurring in response to an exposure requirement change in the printer or electrophotographic copier that is within a full exposure range of the printhead.

Ng et al. teaches an apparatus and a method for controlling the uniformity of the light emitted from the arrays of light emitting elements, wherein the process control determines not only whether the printhead is still within the calibration specifications but

also whether a global exposure change is needed/required so as to calculate a new nominal LED power and to correct the time duration of the current supplied to the LEDs (Fig. 9) (col. 9, lines 13-67).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the device of Sawada by incorporating the teaching of Ng et al. for performing the calibration of the light emitting elements each time a global exposure change is required such that normal production printing can continue without diminishing the quality of the image.

Sawada in view of Ng et al. further teaches adjusting the time duration of the modulated current to correct for the light output of the LED and thus fails to teach the correction of the light output from each LED subset being a function of more or less applied voltage or more or less supplied current so that a dimmer LED receives more voltage or current and a brighter LED receives less voltage or current.

Nevertheless, it is old and well known in the art that one can adjust the light quantity output of the LED by altering either the magnitude of the supplied current or the pulse width of the modulated current, i.e. alter the time duration of the supplied current flowing into the LED, as evidenced by Uebbing et al., which discloses an apparatus and a method for providing correction for amount degradation in the light output of the LED in an electrophotographic recording device, wherein the correction of the light output of the LED can be performed by alternatively varying the pulse-width modulation or the magnitude of the supplied current (col. 2, lines 29-34) (col. 4, lines 19-32). It is also noted that increasing and decreasing the magnitude of the supplied current or the

applied voltage results in the direct increase and decrease of the light quantity output of the LED.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the device of Sawada by altering the magnitude of the supplied current flowing into the LED as taught by Uebbing et al. for the purpose of compensating for the light quantity output of the LED since Uebbing et al. this to be old and well known method for changing the light flux of the LED.

With regard to claims 26-27 and 33-34, Sawada fails to teach the factors pertaining to the above-mentioned (a) and (b) including linear functions of light output versus applied voltage or supplied current and non-linear functions of light output versus applied voltage or supplied current.

Uebbing et al. discloses an apparatus and a method for providing correction for amount degradation in the light output of the light source in an electrophotographic recording device, wherein to obtain the amount of compensation for degradation in light output, the average amount of light output for the print head is measured at various temperatures and as a function of the supplied current, the supplied current being provided by varying the system reference voltage V_R (col. 2, line 51 to col. 3, line 2) (col. 6, lines 24-65). Uebbing et al. further teaches the amount of compensation for the light output of the light recording elements including a factor as a linear function of light output versus supplied current (i.e., factor x. I, where I is the supplied current and x the current non-linearity coefficient) (see Equation (4) at col. 6, line 34). Uebbing et al. further teaches that alternatively, the amount of compensation for the light output of the

light recording elements including a factor as a non-linear function of light output versus supplied current (using partial derivatives as in Equation (6) at col. 7, line 5) (col. 6, line 66 to col. 7, line 15).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the device of Sawada by incorporating the linear and/or non-linear functions of light output versus supplied current as taught by Uebbing et al. The motivation for doing so would have been to accurately correct the light output of the light recording elements through a range of the supplied current such that the uniform light output of the print head is more suitable for precision gray scale printing as suggested by Uebbing et al.

With regard to claims 29 and 36, Sawada further teaches the calculating step involving using difference data describing a difference between a factor pertaining to (a) and a factor pertaining to (b) (the correction of the emission quantity of the LEDs in the plural LED chips involves measuring the emission quantity of the LEDs in a chip and the subsequent measuring of the average exposure energy of each LED chip to correct the quantity of light of each chip so as to make the average exposure energy of the LED chips equal to each other, thus implying comparing the deviation of the emission quantity of the LEDs with respect to the measured average).

3. Claims 28 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada in view of Ng et al. and Uebbing et al., as applied to claims 1 and 6 above, and further in view of Kawabe et al. (US 5,812,176).

Sawada, as modified by Ng et al. and Uebbing et al., discloses all the basic limitations of the claimed invention except for the factors pertaining to (a) and (b) including quadratic functions.

Kawabe et al. discloses an image forming apparatus and a correction method for compensating the fluctuation of the exposure amount of each of the recording element, by measuring three times the brightness E_i of each of the recording element, calculating the averaged value E_o of all brightness values to be used as the reference brightness E_o and forming the ratio of the measured brightness E_i and the reference brightness E_i, to be used as the compensation data C_i, to be used to alter the output emission of the target recording element to compensate for the fluctuation of the brightness of target recording element (col. 25, line 50 to col. 26, line 20). Kawabe et al. further teaches the brightness of one of the recording element can be calculated by using a quadratic function corresponding to characteristics of the used array of the LEDs (col. 24, line 47-55) (col. 25, lines 39-49).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the device of Sawada by using the quadratic function corresponding to characteristics of the used array of the LEDs to derive the light amount of the target LED as taught by Kawabe et al. since Kawabe et al. teaches this to be known in the art to use the quadratic function to obtain the same resulting amount of light for the individual light recording element.

4. Claims 32 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada in view of Ng et al. and Uebbing et al., as applied to claims 1 and 6 above, and further in view of Bollansee et al. (US 5,640,190).

Sawada in view of Ng et al. and Uebbing et al. discloses all the basic limitations of the claimed invention except for the plural subsets including the plurality of LEDS includes a plurality of LEDS having substantially similar light-output-versus-applied-voltage or -supplied-current.

Bollansee et al. discloses an LED printer whose print head includes a plurality of subsets of LEDs, wherein the average of light output of each subset is adjusted by providing a current proportional to the correction factor (col. 5, lines 17-23), and wherein the subsets of LEDs are grouped by classes having about the same correction factor (col. 11, lines 13-30).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the device of Sawada by incorporating subsets of light emitting elements having similar light-output-versus-applied-voltage or -supplied-current as taught by Bollansee et al. The motivation for doing so would have been to allow the print head to provide a more uniform light distribution.

Pertinent Prior Art

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ng (US 4,998,118) teaches a calibration operation of all the LEDs being performed at a next occasion when the exposure requirement change is needed due to the change of the temperature of the print head.

Response to Arguments

6. Applicant's arguments with respect to amended claims 1, 6, 26-29, 32-36 and 39 have been considered but are moot in view of the new grounds of rejection.

7. Applicant's arguments filed 07/26/08 have been fully considered but they are not persuasive with regard to the combination of Sawada and Uebbing et al.

Applicant argues that the "[s]teps S12 and S13 [in Sawada] appear to contradict the Examiner's suggested way of modifying Sawada [with Uebbing et al.]" The examiner respectfully disagrees. Sawada teaches measuring the light emission quantity of each LED in step S12 [0018], and allocating the time correction bit for adjusting the driving current of each LED in step S13, in which step, the time correction bit/allocation performance is to identify each LED for correcting the time duration of the driving current to be supplied to that LED [0019]. Uebbing et al. teaches that correcting the time duration of the driving current or correcting the amplitude of the driving current will equally adjust the light quantity of each LED as it is well known in the art. Therefore, in step S13 of Sawada, by substituting the correction of the time duration of the driving current pulse with the correction of the amplitude of the driving current pulse will equally and efficiently control the light quantity of the LEDs.

Conclusion

8. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai C. Pham whose telephone number is (571) 272-2260. The examiner can normally be reached on M-F 8:30AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Luu can be reached on (571) 272-7663. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hai C Pham/
Primary Examiner, Art Unit 2861
November 19, 2008